Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB.

Conducted and published for the Club, by

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FRANK SHIPLEY COLLINS
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Vol. 20. August, 1918. No. 236.

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Boston, Mass.
1052 Exchange Building.

Providence, R. I.
Preston and Rounds Co.

RHODORA.— A monthly journal of botany, devoted primarily to the flora of New England. Price, *$1.50* per year (domestic and foreign); single copies 15 cents. Prices of Volumes 1 and 2 (1899 and 1900) on application. All remittances by check or draft, except on Boston or New York, must include ten cents additional for cost of collection. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be gladly received and published to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than one page of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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Subscriptions, advertisements, and business communications to
W. P. RICH, 300 Massachusetts Avenue, Boston, Mass.

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 20. August, 1918. No. 236

A PLEA FOR AUREOLARIA.

FRANCIS W. PENNELL.

AMERICAN botanists owe a debt of gratitude to Dr. S. F. Blake for his verification of many types of the species published by early workers in our field, results presented in the scholarly series of papers which has been appearing in RHODORA. In the current volume, page 66, is given the identity of *Rhinanthus virginicus* L. I am glad to accept the correction proposed, and, with Dr. Blake, wonder by what chance Pursh confused this species with his own "new" *Gerardia quercifolia.*

I cannot agree with Dr. Blake as to his application of the name *Gerardia flava* L. Linné gives citations — referring to Gronovius it is true — but after these he presents, as was his custom with species more carefully studied, a diagnosis. We know from B. D. Jackson's Index to the Linnean Herbarium that in 1753 Linné had in his herbarium a specimen, and from various determinations, acceded to by Dr. Blake, this is the glaucous species. The diagnosis favors this. The leaves are described as "basi incisapinnatim sinubus patulis," phrases usually too strong for the pubescent, but excellently describing the glaucous species. Moreover in the pubescent plant the flowers are very shortly and stiffly pediceled, so that the "spica" is scarcely to be characterized as "laxa."[1] To apply a Linnean name to a citation, in defiance of an extant specimen and a diagnosis apparently based upon this, is surely not warranted.

But it is to plead for the segregation of "Gerardia," or as I am pleased to note Dr. Blake agrees to term it *Agalinis,* that this paper is

[1] Or if *laxa* signifies a "spica" more broken, the advantage is still with the glaucous species.

written. Dr. Blake discusses my separation of *Aureolaria* and *Agalinis*, confining his remarks however to the provisional key given by me in considering only the species of the Atlantic Coastal Plain.[1] That he so confines his discussion cannot but leave some doubt as to the intimacy of his acquaintance with the plants of this group.

To those who seek to express species-relationship no fact becomes plainer than that each group must be viewed in the totality of its characters. To found a group upon a single character is unfortunate. Also to conclude, as has been reasoned, that because in one alliance a character is of little or great value, therefore it is valueless or of exceeding value in some other alliance, is logic often disproved. Characters, such as color, frequently of trifling worth, are in some groups of great racial importance. Moreover, while we would like to standardize Nature, by the conditions of Evolution we cannot make our genera truly co-ordinate. *Aureolaria* and *Agalinis*, separated, possibly have not the value, that is distinctness, of *Pedicularis*, but the facts I shall present I think show conclusively that they have far more distinctness than has any possible combination of these, together, or with other allies.

My key, referred to, distinguished these as follows:

"Corolla yellow. Anther-sacs parallel, awned at base. Capsule acute to acuminate. Seeds wingless or winged.....3. *Aureolaria*
"Corolla pink or purple. Anther-sacs more or less divergent, obtuse to mucronate-awned at base. Capsule rounded at apex. Seeds wingless. 4. *Agalinis*"

To these characters might be added:

Aureolaria.— Parasitic on roots of trees, each species restricted to one or few allied hosts, usually species of *Quercus*. Stems relatively stout. Leaves lanceolate to ovate, entire to bipinnatifid-lobed, relatively large.
Agalinis.— Parasitic on roots of herbaceous plants, rarely on shrubs or trees, each species on many diverse hosts (excepting in *A. linifolia* (Nutt.) Britton). Stems slender. Leaves linear-lanceolate to filiform or subulate, entire (except that toothing sometimes occurs in *A. heterophylla* (Nutt.) Small).

Of course these are vegetative characters, but they are characters in correlation with those of flowers and fruit. Let us consider these latter characters, those presented in the key above.

First, color of corolla.[2] *Aureolaria* possesses large corollas, in some

[1] Bull. Torr. Bot. Club **40**: 404. 1913.

[2] It may perhaps appear hazardous to discuss a character so perishable as color. But of the 48 species of *Aureolaria, Agalinis* and *Otophylla* of the United States I have collected and made descriptions of the fresh corollas of 43. The remaining 5 are closely akin to species seen.

species with irregularly distributed red-purple markings within. *Agalinis* possesses usually smaller thinner corollas, rose-pink to pink (not purple as previously stated), normally within on the anterior side marked with two longitudinal yellow lines to the antero-lateral sinuses, between which lines are almost always red-purple spots. The few cases where either lines or spots are lost seem evidently due to suppression. Possible exception must be made of the aberrant *A. linifolia*, in which, while spotting is present, the lines are absent. This species is too isolated for the student to risk the assumption that lining was ever present.

Second, anther-sacs. The anther-sacs of two of the three subgenera into which I would divide *Aureolaria* bear strongly developed horn-like awns. These are almost always somewhat curved. In spite of Dr. Blake's figure I can see little in common — except evolutionary origin — between these and the delicate semi-awning of *Agalinis*. In *Agalinis* there is every gradation between anthers rounded and anthers seemingly awned, but the latter state is ever an indeterminate attenuation and fusing, sometimes with slight hardening, of the lips of the orifice.[1] A far stronger case for his argument would be the condition found in my proposed third subgenus of *Aureolaria*, that which includes only the Mexican species, *A. Greggii* (S. Wats.).[2] In this the anther-sacs are quite awnless. But in other essential features this is an *Aureolaria*, nor does it seem surprising — and certainly no evidence of close kinship — that a primitive awnless state should be retained both here and in *Agalinis*. *A. Greggii* stands in some other features apart from typical *Aureolaria*, as does the equally aberrant *Agalinis linifolia* from others of that genus.

Third, capsule-shape. The distinction in this is constant, but the key-phrase for *Agalinis* should read "rounded with a mucro."

Fourth, seeds. In two subgenera of *Aureolaria* the seeds are

[1] Also the awning is always minute, I have seen no specimen showing this "precisely intermediate" with *Aureolaria*. *Agalinis* **peduncularis** (Benth.) Pennell, comb. nov. (*Gerardia peduncularis* Benth. in Hook. Comp. Bot. Mag. **1**: 209. 1835–6) seems a singularly unfortunate species to have been selected as intermediate, inasmuch as in this the anther-sacs vary from awnless to minutely awned, or as I would express it, from "acuminate to cuspidate." The awns of *Aureolaria* **grandiflora** (Benth.) Pennell, comb. nov. (*Gerardia grandiflora* Benth., l. c. 206), it is true, are short for that genus, but they are stout and slightly decurved, resembling minute horns.

[2] *Aureolaria* **Greggii** (S. Wats.) Pennell, comb. nov.— *Gerardia Greggii* S. Wats. in Proc. Amer. Acad. **18**: 131. 1883.

winged, but they are wingless in *Panctenis*, *A. pedicularia* (L.) Raf. and *A. pectinata* (Nutt.) Pennell. But for proving kinship such lack of winging is negative. Moreover the seeds of *Panctenis* and of *Agalinis* are readily distinguishable; in *Panctenis* they are plumper and the reticulations of the seed-coat are slightly raised giving a surface roughened, minutely honeycombed; in *Agalinis* the thinner usually more angular seeds are practically smooth.

Such is the correlation, not absolute, of characters by which to distinguish *Aureolaria* and *Agalinis*. Less may be urged for *Otophylla*. But certain features appear. Most important, I believe, is the reduction of the anthers of the posterior pair of stamens. Correlated with this we find: stem retrorse-hispid (not ascending-scabrous to glabrous as in *Agalinis*); leaves broader, lanceolate to ovate, in one species usually incised at base, in the other bipinnatifid; pedicels shorter, so that flowers are nearly sessile; corolla (as in *Agalinis linifolia*) with no trace of yellow lines within; and seeds honeycombed.

Now let us hold these three natural groups in one genus and attempt to find characters by which to distinguish the whole from allied genera. Allies are found in South America, and especially in Africa and Asia.

(A) The open-throated corolla is satisfactory for our flora but cannot be used as against *Sopubia*, *Graderia*, etc. Moreover it is not constant within "Gerardia," for in one section of *Agalinis* the corolla is progressively modified through stages present in various species[1] into the flattened "two-lipped" corollas of *A. divaricata* (Chapm.) Pennell and *A. filicaulis* (Benth.) Pennell.

(B) Equivalence of anther-sacs. In most of the allied genera we find a reduction of one sac of each anther.[2] But in certain of the Old World genera, and such New World allies as *Afzelia* (*Seymeria*) and *Silvia* this does not occur. Moreover absence of reduction is again purely a negative character. *Otophylla* is reducing its anthers by another process, also worthy of recognition.

(C) Absence of bractlets on pedicel. Again a negative character; of value in distinguishing from many Old World, but not from New World allies.

(D) There is but one other point occurring to me, the only feature

[1] *E. g.* our common *A. tenuifolia* (Vahl) Raf.

[2] There is an American species, wrongly heretofore held in "Gerardia," which shows this well, *Gerardia hispidula* Mart. This possesses other points of distinction, including bluish corollas and bractlets on pedicel.

which is positive, the fact that the two plate-like lobes of the stigma have fused, leaving as stigmatic areas only the lines of fusion on either side. But this condition is true, and also stages of evolution toward it are shown, in others of this tribe. There is a southwestern species which we have long been assured is a "Gerardia," *G. Wrightii* A. Gray, in which the stigma is capitate. Having correlated characters, I consider the last a monotypic genus. To be required to retain it in an aggregate *Agalinis* would certainly make all definition that defines hopeless.

If we accept as distinct genera *Aureolaria* and *Agalinis* we have for each excellent correlations of mostly positive characters; of habit, leaf, corolla-color, anther-awning (with one exception), capsule-shape and (of two types in *Aureolaria*) of seed. Moreover with one exception, the specific range of parasitism is quite different. If we unite these, or place others with them, and then seek to limit our aggregate genus, we find our problem difficult and any result unsatisfactory. Of course genera can be built upon single characters, but the purpose of genera is the expression of kinship, not the arbitrary division of the field of nature into categories of classification.

Pardon so long a discussion. But I feel that misunderstanding frequently exists, because we can not or do not make our comparisons sufficiently broad. Frequently the cry is raised, and too often with justification, against the splitting of old genera into segregates — these apparently distinct for the area under consideration but well-merged by intermediate species elsewhere. More rarely, or at least less protested, is the opposite case, the joining of natural groups into aggregates which beyond the home-area are ill-defined or not definable. I hope that this paper has presented clearly enough one such case, and that for the future we can all agree in the use of the names *Aureolaria* and *Otophylla*.

New York Botanical Garden.

SOME ALLIES OF RYNCHOSPORA MACROSTACHYA.

M. L. Fernald.

The only Rynchosporas of the large-fruited series which are found from New Jersey to Massachusetts are referred to *R. macrostachya* Torr. and *R. macrostachya*, var. *inundata* (Oakes) Fernald, although Dr. Britton, who does not recognize the specific distinctness of *R. macrostachya*, refers both these plants to *R. corniculata* (Lam.) Gray. A recent examination of the New England material, however, has brought to light certain heretofore overlooked characters, which indicate conclusively that *R. macrostachya* is specifically distinct from *R. corniculata*, and, at the same time, that the little plant described by William Oakes from West Pond, Plymouth, Massachusetts, as *Cerato-schoenus macrostachys*, *β. inundatus* [1] is specifically distinct from both. This latter discovery is particularly gratifying in view of Oakes's observation when he originally described the plant, that "This variety appears at first sight like a distinct species." Oakes, it would seem, was deceived by the assumption that the occurrence of his variety from West Pond "in deeper water than the common one" was "the cause of its different appearance."

R. macrostachya is a non-stoloniferous plant, the new autumnal shoots being erect and arising from within the old sheaths and growing close to the old culms. The plant described by Oakes as var. *inundata* is a comparatively rare plant, found, so far as known, at a single pond in Plymouth County, Massachusetts, in one or perhaps two ponds on Long Island, and at only a few stations in New Jersey, and all the material shows it to be loosely stoloniferous, the new horizontal leafless offshoots being a decimeter or more in length. The plant is very much smaller in all its parts than *R. macrostachya*, growing much lower, only 2–6 dm. high, and having much more slender leaves and shorter spikelets. The striking difference in the habit of the plant has already been emphasized by Oakes and again by the present writer,[2] *R. macrostachya* having the branches of the large inflorescences strongly fastigiate, the primary glomerules with 10–50 spikelets. Var. *inundata*, on the other hand, has the inflorescence diffuse, the primary glomerules with few spikelets (1–6). But the most pronounced differences are found in the mature fruits. In *R. macrostachya* the mature achene is

[1] Oakes in Hovey's Mag. vii. 185 (1841).

[2] Fernald, Rhodora, xviii. 164 (196).

5–6 mm. long, 2.6–3 mm. broad; the tubercle 1.9–2.2 cm. long; and the 6 bristles mostly 1.1–1.4 mm. long. In Oakes's variety the mature achenes are 4.2–4.8 mm. long, 2.2–2.6 mm. broad; the tubercle 1.5–1.7 cm. long; and the bristles 0.9–1.1 cm. long. It thus seems that the plant which is passing as *R. macrostachya*, var. *inundata* is clearly distinct from *R. macrostachya* and should be called

Rynchospora **inundata** (Oakes), n. comb. *Ceratoschoenus macrostachys*, β. *inundatus* Oakes in Hovey's Mag. vii. 185 (1841). *R. macrostachya*, var. *inundata* Fernald, Rhodora, viii. 164 (1906).

When the present writer transferred Oakes's variety to *Rynchospora* he identified with it Chapman's Florida plant, which was originally described as *Ceratoschoenus macrostachyus*, var. *patulus* in 1860.[1] This variety of Chapman's is considered by Britton a variety of *R. corniculata*, with which Britton unites *R. macrostachya*, but it has characters which separate it very definitely from all three species. Like *R. inundata*, this Florida plant is loosely stonoliferous and has the diffuse inflorescences, which characters separate it at once from *R. macrostachya;* and its achene is much shorter than in the non-stoloniferous *R. macrostachya* but very much broader than in the stoloniferous *R. inundata*, while its tubercles and bristles are shorter than in either of those species. From *R. corniculata*, which the plant resembles, it is separated at once by its shorter achene, shorter tubercle and much longer bristles. This plant, of which there is a large amount of material in the Gray Herbarium, collected by Chapman and others in Florida, and some specimens from north to South Carolina, has the achenes 4.2–4.6 mm. long, 3–3.5 mm. broad, the tubercle 1–1.4 cm. long, and the usually 4 bristles 4.4–8 mm. long; typical *R. corniculata*, which abounds from Florida westward to Louisiana and extends northward to Delaware and Missouri, having the achenes 5–6 mm. long, 2.8–3.3 mm. broad, the tubercle 1.5–1.8 mm. long, and the 5–7 very short bristles at most 3–4 mm. in length. Chapman's plant seems, therefore, to be a definite species, but, in view of the fact that there are already species bearing the names *R. patula* and *R. Chapmanii*, another name is necessary for it. It is, therefore, a pleasure to commemorate in the name of this species the discrimination of that prince of students of the *Cyperaceae*, John Carey, who marked upon one of the Chapman sheets in the Gray Herbarium "These specimens incline me to think that this is indeed a good species." This species is then

[1] Chapman, Fl. 529 (1860).

Rynchospora **Careyana**, n. nom. *Ceratoschoenus macrostachyus*, var. *patulus* Chapman, Fl. 529 (1860). *R. corniculata*, var. *patula* Britton, Trans. N. Y. Sci. xi. 84 (1892). *R. macrostachya*, var. *patula* Chapman, Fl. ed. 3, 556 (1897).

Typical *R. corniculata* (Lam.) Gray has the achenes round-obovate and twice as broad as the base of the tubercle, the achenes measuring 5–6 mm. long, 2.8–3.3 mm. broad. This plant, as already stated, extends from Florida northward to Delaware and westward to Louisiana, thence north to Missouri. The commoner plant westward, in Texas and Arkansas, locally northward to Indiana and occasionally eastward to Alabama, has a more slender achene which at the summit is scarcely broader than the base of the tubercle, so that the two seem nearly confluent. In this plant the somewhat duller achenes measure 4.5–5.3 mm. long, 2.4–2.6 mm. broad, but its perianth-bristles and aspect are quite like those of typical *R. corniculata*. Differing only in the much narrower and somewhat shorter achene and conspicuously overlapping the range of *R. corniculata*, the plant is probably best treated as a geographic variety, which is here proposed as

Rynchospora corniculata (Lam.) Gray, var. **interior**, n. var., achaeniis fuscis 4.5–5.3 mm. longis 2.4–2.6 mm. latis cum tuberculis subconfluentibus.— Alabama to Texas, Arkansas, and Indiana. Type: swamps, southern Arkansas, *F. L. Harvey*, no. 24 (Gray Herb.).

Briefly summarized the distinctions between the species above discussed may be stated as follows:

Bristles mostly exceeding the achene; the longest 4.4–14 mm. long.
- Plant non-stoloniferous: inflorescence fastigiate; the primary glomerules with 10–50 spikelets; achene 5–6 mm. long: tubercle 1.9–2.2 cm. long: bristles 6, 1.1–1.4 cm. long. . . . . *R. macrostachya* Torr.
- Plant loosely stoloniferous: inflorescence diffuse; the primary glomerules with few spikelets: achene 4.2–4.8 mm. long: tubercle 1–1.8 cm. long: bristles 4–6, the longer 4.4–11 mm. long.
  - Achene 2.2–2.6 mm. broad; tubercle 1.5–1.7 cm. long: bristles 6 (rarely 5), the longest 9–11 mm. long. . *R. inundata* (Oakes) Fernald.
  - Achene 3–3.5 mm. broad; tubercle 1–1.4 cm. long: bristles 4 (rarely 5 or 6), the longest 4.4–8 mm. long. . . . . *R. Careyana* Fernald.

Bristles much shorter than the achene, all but 1–3 very short or nearly obsolete; the longest 2.5–4 mm. long: plant apparently not stoloniferous.[1]
- Achene 5–6 mm. long, 2.8–3.3 mm. broad, twice as broad as the base of the tubercle. . . . . *R. corniculata* (Lam.) Gray.
- Achene 4.4–5.3 mm. long, 2.4–2.6 mm. broad, the summit scarcely broader than the base of the tubercle. . . . . *R. corniculata*, var. *interior* Fernald.

Gray Herbarium.

[1] The herbarium material shows only fragmentary bases but these lack the loosely divergent stolons so characteristic of *R. inundata* and of *R. Careyana*. Further observations and better collections may show definite stolons in *R. corniculata*.

NOTES FROM THE WOODS HOLE LABORATORY — 1917.

Edited by F. S. Collins.

(Plate 124.)

I. Species new to Science or to the Region.

The summer of 1917 proved quite fruitful in novelties at Woods Hole, and from the data and material submitted to me by Dr. I. F. Lewis, of the botanical staff of the Laboratory, I have made up the following notes. The fresh water material is from Wood Pond at Woods Hole, and from Tarpaulin Pond, near Tarpaulin Cove, Naushon, Elizabeth Islands. Miss Jane M. Furber has made a special study of the flora of the latter pond, both as to species found there, and as to seasonal variations; the results of her study will be published later, and I here include from this station only species new to science or to this region. A new species of *Erythrotrichia,* from Woods Hole, collected by F. G. Gustafson, is described on the following pages by Ralph E. Cleland. A new genus of Conjugatae is of importance enough to justify a special paper, which will soon be published by Dr. Lewis, who detected it in material from Wood Pond.

Chroococcus limneticus Lemmermann, Beiträge zur Kentniss der Planktonalgen, II. Bot. Centralblatt, Vol. LXXVI, p. 153, 1898. This is common in both Wood and Tarpaulin Ponds, among other algae. The cells are 8–13 μ diam., aeruginous; the tendency to division is considerably less in one direction than in the other two, and as the cells remain much in the position assumed on dividing, the result is a Merismopedium-like frond in surface view; the cells are similarly placed, quadrately, but the outline of the frond is irregular, not square as in *Merismopedium;* moreover any large colony is at least two cells thick. It was reported from Lake Erie by Miss Julia W. Snow, The Plankton Algae of Lake Erie, Bull. U. S. Fish Com., p. 392, 1908, but has not been recorded in this part of the country.

Microchaete **naushonensis** n. sp. Filamentis non attenuatis nec incrassatis, rectis vel subflexuosis, interdum erectis, vulgo prostratis; trichomate 6–7 μ diam., purpureo, longitudine cellularum diametrum aequante, paullo plus vel minus; cellulis inferioribus cylindricis, indistinctis; superioribus subrotundatis, moniliformibus; vagina

tenui, membranacea, aequali, hyalina; heterocysta basali globosa, vel superne subapplanata, 5–6 μ diam., interdum solitaria, vulgo sub heterocysta cylindrica, apicibus rotundatis, 7–8 × 10–17 μ, haud raro duo, raro tres seriatis super heterocystam basalem; heterocystis intercalaribus? sporis?

Filaments neither thickened nor attenuate, straight or subflexuous, sometimes erect, usually prostrate; trichome 6–7 μ diam., cells as long as broad or slightly more or less; lower cells cylindrical, indistinct; upper cells rounded, moniliform; sheath thin, membranaceous, even, hyaline; basal heterocyst globose, or somewhat flattened above, 5–6 μ diam., sometimes solitary, commonly below a cylindrical heterocyst with rounded ends, 7–8 × 10–17 μ, frequently two, rarely three such heterocysts in a series above the basal heterocyst. Intercalary heterocysts and spores not observed. On leaves of *Sphagnum* and other water plants, occasionally on *Oedogonium*, Tarpaulin Pond, August, 1917, *Miss J. M. Furber*. Type in Collins herbarium.

On the *Sphagnum* leaves the prostrate filaments usually run lengthwise, either up or down; often two basal heterocysts will be in close contact, the filaments of both forming a straight line, giving the effect of one filament with two intercalary heterocysts. On *Oedogonium Borisianum* the filaments wind spirally about the host filament. *Hapalosiphon pumilus* and *H. hibernicus* occur with it, but lack the purplish shade of the *Microchaete*, and of course are amply distinct in branching.

Bulbochaete **Furberae** n. sp. Dioecia, nannandria, gynandrospora; oogoniis depresso-globosis, sub seta terminali, patentibus (interdum adparenter erectis); dissepimento infimo; oosporae episporio scrobiculato; androsporangiis sparsis, 1–9-cellularibus, nannandriis ad oogonium, antheridio interiori, stipite valde curvato, antheridio breviore.

Dioecious, nannandrous, gynandrosporous, oogonium depressed-globose, below terminal seta, patent (sometimes apparently erect); dissepiment very low; epispore of oospore scrobiculate; androsporangia scattered, 1–9-celled nannandria on oogonium; antheridium interior, stipe strongly curved, shorter than the antheridium.

Wood Pond, Woods Hole, Massachusetts, Aug., 1917. *Miss J. M. Furber & I. F. Lewis.* Type in Collins herbarium.

Veg. cell,	10–15 μ diam., 3–5 diam. long.
Oog.	36–43 μ diam., 27–34 μ long.
Andr. cell,	9–10 μ diam., 8–9 μ long.
Nann.	7–8 μ diam., 20–25 μ long.

The oogonium is occasionally on one of the lower cells of a branch, but more commonly on the upper cell; usually this cell bears a seta

and the oogonium is patent, but not infrequently the seta does not develop, and in that case the oogonium is regularly erect. The nearest relative seems to be *B. Brebissonii*, but that species has larger dimensions, fewer-celled androsporangia, and less curved dwarf males.

B. ELATIOR Pringsheim, not before recorded for America, also occurs in the Wood Pond material, and is of much the same dimensions as *B. Furberae*, but has oogonia more angular and with smooth epispore, and androsporangia epigynous. *B. intermedia* var. *supramediana* Hirn, already known in Massachusetts, also occurs, but it is a plant of larger dimensions than *B. Furberae*, with relatively shorter cells and higher dissepiments.

MIKROSYPHAR PORPHYRAE Kuckuck, Bermerkungen zur marinen Algenvegetation von Helgoland, II, p. 381. This forms minute brown dots in the fronds of *Porphyra umbilicalis* (L.) J. Ag., ultimately destroying the infested portion of the latter, leaving a perforation in place of the *Microsyphar* colony. The filaments wind between the large cells of the host, branching more or less freely, with no erect filaments and no hairs. The fructification is of the simplest type, a single zoospore forming in the terminal cell of a branch, or a few zoospores forming each in a small cell partitioned off in such a terminal cell, constituting a very rudimentary plurilocular sporangium. It is fairly common, with various other epiphytes and parasites, at one or two stations at Woods Hole, and has not before been reported in this country.

NOSTOC PUNCTIFORME Hariot ex Bornet & Flahault, Revision des Nost. Het., part IV, p. 189, 1888, was found throughout the summer at Tarpaulin Pond. It is so closely associated with *Sphagnum* sp. that it may be called symbiotic. Sometimes it is found on the surface of the leaves, but more usually it occurs inside the dead and otherwise empty cells so characteristic of *Sphagnum*. It is also found in the cells of the stem. The *Sphagnum* does not react visibly to the presence of the *Nostoc*. *N. punctiforme* has been recorded, Forti, Syll. Myx., p. 388, as widely distributed in Europe, South America and the oceanic islands of the tropics as an epiphyte and endophyte on *Lemna*, in *Gunnera* and several lichens, and also on moist earth. From the United States it has been reported, Tilden, Minnesota Algae, p. 164, only as an endophyte in the roots of cycads, where it is associated with nodule formation and with a peculiar mode of growth of the roots.— F. S. COLLINS, North Eastham, Massachusetts.

II. A new Erythrotrichia from Woods Hole.

Erythrotrichia rhizoidea, n. sp. Thallus filamentoso-teres, roseus v. roseo-purpureus, rectus, 1–4 mm. longus, 10–50 μ diametro. Basis rhizoidalis, ex qua breves recti thalli secundarii nascuntur. Sporae roseae, 8–10 μ diametro.

Thallus dark red to reddish-purple, upright, terete, 4 mm. long at most, usually 1–2 mm. in length; 10 μ in diameter at base, increasing to 40–50 μ above; dividing at base into several short, irregularly down-growing rhizoidal filaments, which penetrate into the tissue of the host, and from which arise often one or more secondary thalli, rarely approaching the primary thallus in length, usually much shorter. Cells roundish-polygonal, 10–20 μ in diameter, dividing above in both horizontal planes into 4–8 cells. Spores reddish, 8–10 μ in diameter. Sexual organs not observed. Growing on *Porphyra umbilicalis* in the harbor of Woods Hole, Mass. Abundant. August, 1917.

This species differs from *E. Bertholdii* Batt. (= *E. ciliaris* Berth., but not *Bangia ciliaris* Carm., according to Batters) [1] in its smaller size, the presence of secondary upright thalli, and the rhizoidal nature of the holdfast. *E. Bertholdii* Batt. is attached merely by its slightly expanded basal cell.

It differs from *E. discigera* Berth.,[2] in that it has no definite basal disc as holdfast, and the holdfast is never seen without filaments attached.

Differs from *E. ciliaris* Batt.,[1] the species that Batters considers to be the original *Bangia ciliaris* of Carmichael, in the absence of a basal disc. In *E. ciliaris*, also, the erect filaments all appear to be of about the same strength and length. In our species, however, only one filament attains to any length, the others, when there are others, being usually very short.

E. obscura Berth.[2] does not fit our species in the following respects:— 1. Its blackish color. 2. When there are more than one series of cells, they lie in one plane. 3. The erect frond may have branches at the base, but no rhizoids. 4. The holdfast is in the nature of a basal disc. 5. In summer, the basal discs are very usually found bearing no erect filaments.

[1] Batters, E. A. L. New or Critical British Marine Algae. Journal of Botany, Vol. 38, pp. 369–379.

[2] Berthold, G. Die Bangiaceen des Golfes von Neapel. Fauna u. Flora des Golfes von Neapel, Vol. VIII, Leipzig, 1882.

We seem here to be dealing with a new species. Its main points of difference from previously described species lie in the rhizoidal nature of the holdfast; the marked differentiation of erect filaments into one primary and several secondary ones; the fact that the secondary filaments develop, not from the main thallus, but from the rhizoids; and the fact that holdfasts have not been seen without erect fronds. The reason for this latter fact appears to lie in the nature of the development from the spore. The spore, upon germination, gives rise to an upright filament which later becomes the primary thallus. When this is only a few cells in length, the lowest cell appears to swell and puts forth two or three filaments downward into the host tissue. The holdfast develops later therefore than the primary thallus. Any secondary filaments that may appear arise as buds from these rhizoid-like structures.

No sexual reproduction has been observed in this plant, but spores are produced in the manner characteristic of the genus.— Ralph E. Cleland, University of Pennsylvania.

Explanation of Plate 124.

Fig. 1. Bulbochaete Furberae; erect oogonium. × 485.
Fig. 2. " " patent oogonium. × 485.
Fig. 3. " " immature oogonium with two dwarf males. × 485.
Fig. 4. " " oogonium slightly more developed, with five dwarf males. × 485.
Fig. 5. " " androsporangium. × 485.
Fig. 6. Erythrotrichia rhizoidea; holdfast. × 455.
Fig. 7. " " secondary thallus arising at base of primary thallus. × 485.
Fig. 8. " " formation of spore. × 455.
Fig. 9. " " escaping spore. × 455.

Figs. 1–5 are by I. F. Lewis; 6–9 by R. E. Cleland.

THE SPECIFIC IDENTITY OF BIDENS HYPERBOREA AND B. COLPOPHILA.

M. L. Fernald.

In 1885 Mr. J. M. Macoun collected at Rupert House, James Bay, a little *Bidens* which was subsequently described as *B. hyperborea* Greene.[1] This collection consisted of three small plants each with one head and with the foliage badly mangled. Somewhat later the present writer,[2] in attempting to identify a characteristic plant of the tidal reaches of the rivers of the Gaspé Peninsula, finally decided that the Gaspé plant was best placed with *B. hyperborea,* the achenes of the two being exactly alike in their technical characters, that is, they were flat linear-cuneiform strongly striate achenes, without the suberous margins and prominent ribs which are so characteristic of *B. cernua.* Still later, in 1909, material collected in southern Maine, along Winnegance Creek, was referred by Fernald & Wiegand[3] on account of its achene-characters to *B. hyperborea.* Subsequently, in studying this material and some other specimens from adjacent waters of the lower Kennebec and Androscoggin systems in Maine, characters were found which seemed to set this Maine plant off very definitely from the little Gaspé plant which had formerly been identified with *B. hyperborea,* and the Maine plant was consequently described as *B. colpophila* Fernald & St. John.[4] During the summer of 1916 Mr. Bayard Long and the writer collected plants of this affinity extensively in Maine, where they abound on the tidal reaches of the Penobscot and Kennebec systems, and other material heretofore unidentified shows the plant of the lower Penobscot and Kennebec to occur also on the brackish marshes of the Merrimac in Essex County, Massachusetts.

The writer's attention has been redirected to this group of plants by Dr. Earl E. Sherff, who has very kindly called attention to the fact that the Gaspé plant, which had been originally identified with *B. hyperborea,* is very unlike the original James Bay material in some

[1] Greene, Pittonia, iv. 257 (1901).
[2] Fernald, Rhodora, x. 201–203 (1908).
[3] Fernald & Wiegand, Rhodora, xii. 120, 144 (1910).
[4] Fernald & St. John, Rhodora, xvii. 21 (1915).

regards, but that the Maine coast *B. colpophila* is certainly conspecific with *B. hyperborea*. With these decisions of Dr. Sherff the writer is entirely in accord but a detailed study of all the material has convinced him that, although the Gaspé plant differs in certain habital traits, it, with all the other variations, from James Bay, the Maine coast and the lower Merrimac, makes up a single species with certain very clearly marked characters. The superficial trait which separates this complex species of the estuaries and saline marshes, *B. hyperborea*, from the *B. cernua*, with which it is most apt to be confused, is the erect heads which commonly remain quite erect in fruiting,[1] *B. cernua* when well developed having the fruiting heads abruptly nodding. In *B. hyperborea* and its varieties the outer involucre consists of strongly ascending or only slightly spreading bracts; the outer involucre of *B. cernua* being reflexed or strongly divergent, not ascending. The disk-corollas of *B. hyperborea* are 4-toothed, of *B. cernua* commonly 5-toothed. In *B. hyperborea* the anthers are included, becoming exserted only by the shriveling of the corolla; in *B. cernua* the anthers are commonly exserted and conspicuous in the fresh flowering material. But the greatest difference between the two species is in the achenes. In *B. cernua* the fully matured achene is curved and with almost wing-like coarsely retrorse-barbed pale margins and keels and its surfaces between the keels and margins ordinarily smooth or only obscurely furrowed; the outer achenes are 3.3–6.3 mm. long and 2–2.8 mm. wide; and the central achenes 4.2–7.8 mm. long and 1.8–2.5 mm. wide. In *B. hyperborea*, on the other hand, the achenes are straight, flat or flattish and not wing-margined nor with prominent keels, only slightly thickened at the summit and with 7–15 prominent ribs on each face; and the outer are 4.2–8.4 mm. long, the inner 6–10 mm. long, 1.4–1.9 mm. broad, i. e. the achene is flat and more slender than in *B. cernua*.

That *B. hyperborea* (including *B. colpophila*) is thoroughly distinct from *B. cernua* there can be no question, but the species is itself highly variable, the varieties apparently being very definitely isolated. The typical plant from James Bay is not exactly matched by any material the writer has seen, although it is very close to some of the Maine

[1] Some dried material collected by the present writer shows arching of the peduncles which gives in the herbarium the impression that the heads are sometimes nodding; but in these cases the arching was due to leaving the specimens over night in the collecting boxes, and their consequent bending toward the light entering the boxes in the early morning. All material in the field, where the present writer is very familiar with the plant, shows quite definitely ascending fruiting heads.

material. In its absolutely simple monocephalous habit it is extreme, the simplest plants from Maine being usually somewhat branched. The leaves of the James Bay plant are badly crumpled but so far as the writer is able to make out by reconstruction they are blunt or obtuse and with very obscure toothing, the largest leaves measuring about 4 cm. long. The outer bracts of the involucre are 1.5–1.7 cm. long, only slightly exceeding the disk; and the achenes of the Macoun material, some of which have been kindly loaned by Dr. Sherff, measure barely 6 mm. in length, with the marginal awns about 3 mm. long. In these measurements the achenes are like the commoner plant of the Penobscot, Kennebec and Merrimac systems, but much smaller than in the plant of Gaspé rivers or in a very extreme plant which occupies the tidal flats of Cathance River in Maine. But the commoner Maine plant, *B. colpophila,* is much larger in its development than the James Bay specimens, all material definitely branching with the exception of obviously depauperate individuals in which, however, incipient branches are evident. The Maine plant, *B. colpophila,* ordinarily has longer leaves which are mostly long-attenuate at tip and more definitely toothed than in typical *B. hyperborea;* and the outer involucre in *B. colpophila* is decidedly longer, the bracts usually exceeding the disk.

A plant which abounds on the tidal flats of Cathance River and which has been distributed as *B. colpophila* stands apart from both typical *B. hyperborea* and true *B. colpophila* by its much longer achenes. This plant, of which several numbers representing minor variations have been collected, has the outer achenes 7.5–8.5 mm. long, the inner 8.7–10 mm. long with the marginal awns 3.5–5 mm. long, and on account of its extreme abundance along Cathance River and the uniformity of the material collected in large quantity at different spots is considered a pronounced geographic variant. The Gaspé plant which was originally taken for *B. hyperborea* departs from that species in certain conspicuous traits, although its very small subentire leaves are essentially identical with those of the James Bay plant. The Gaspé material shows a very strong tendency to produce numerous arcuate branches; its outer involucre consists of very frondose bracts, 2–6 cm. long, and its achenes are as long as in the Cathance River variant, the outer 6–8 mm. long, the inner 7.5–10 mm. long with marginal awns 3–3.5 mm. long.

To summarize, *B. hyperborea,* as now understood, is an estuary

species of very disrupted range and, presumably on account of the extreme isolation of its habitats, it presents several pronounced geographic variants. These may be defined as follows:

Outer achenes 4.2–5 mm. long; the inner 6–7 mm. long, with marginal awns 1.8–3 mm. long.

Plant simple and monocephalous: leaves oblanceolate and blunt, subentire or obscurely toothed; the longer 4 cm. long: bracts of the outer involucre 1.5–1.7 cm. long, only slightly exceeding the disk. *B. hyperborea* (typical).

Stem branching; the branches strongly ascending, few to very numerous: leaves linear to oblanceolate, attenuate, commonly with 3–10 pairs of sharp teeth; the primary leaves 0.5–1.2 dm. long: bracts of the outer involucre 1.5–4 cm. long.....var. *colpophila.*

Outer achenes 6–8.5 mm. long; the inner 7.5–10 mm. long, with marginal awns 3–5 mm. long.

Tall, 3–7 dm. high, with strongly ascending branches: leaves thin, with midrib prominent beneath, long-attenuate at tip; the primary ones 0.6–1.4 dm. long, with numerous sharp teeth: bracts of outer involucre 4–9, linear to lanceolate, acute or acuminate, entire, 1.5–3.5 cm. long.....var. *cathancensis.*

Low, usually depressed and matted, 0.5–2.5 dm. high, the branches usually arcuate: leaves fleshy, obtuse, with midrib obscure; the primary ones 1.5–6.5 cm. long, entire or with 1 or 2 pairs of coarse teeth: bracts of outer involucre 2–4, oblanceolate, obtusish, entire or toothed, 2–6 cm. long.....var. *gaspensis.*

B. HYPERBOREA Greene, Pittonia iv. 257 (1901).— The typical form of the species is known only from the original collection from Rupert House, James Bay, September 5, 1885, *J. M. Macoun,* no. 12056.

Var. **colpophila** (Fernald & St. John), n. comb. *B. colpophila* Fernald & St. John, RHODORA, xvii. 21 (1915).— Tidal flats and borders of salt marshes, Maine and Massachusetts. The following specimens may be cited: MAINE: abundant on tidal mud-flats of the Penobscot River, Bangor, September 7, 1916, *Fernald & Long,* nos. 14829, 14830; very abundant on tidal mud-flats at the mouth of Reed Brook, Hampden, September 8, 1916, *Fernald & Long,* nos. 14831, 14832, also in *Pl. Exsicc. Gray.* no. 296; tidal mud-flats at mouth of Souadabscook Stream, Hampden, September 11, 1916, *Fernald & Long,* nos. 14833, 14834; borders of salt marsh, Back River Creek, Woolwich, September 15, 1916, *Fernald & Long,* no. 14826; above tide-limit at edge of marsh and among sedges and rushes of salt marsh, Winnegance Creek, Phippsburg, August 23, 1909, *Fernald,* nos. 2248, 2249; Cow Island, Topsham, August, 1910, *Kate Furbish;* bank of Androscoggin River, Brunswick, August 13, 1911, *C. H. Bissell;* August 22, 1911, *R. A. Ware,* no. 4230. MASSACHUSETTS: brackish muddy shore of the Merrimac, Newburyport, October 2, 1902, *A. A. Eaton & M. L. Fernald.*

Var. **cathancensis,** n. var., planta erecta 3–7 dm. alta ramibus valde adscendentibus; foliis tenuibus lineari-oblanceolatis attenuato-acuminatis argute serratis, primariis 0.6–1.4 dm. longis, costa subtus promi-

nente; bracteis involucri exterioribus 4–9 linearibus vel lanceolatis acutis 1.5–3.5 cm. longis; achaeniis exterioribus 7.5–8.5 mm. longis, interioribus 8.7–10 mm. longis aristis marginalibus 3.5–5 mm. longis.

Plant erect, 3–7 dm. high, with strongly ascending branches: leaves thin, linear-oblanceolate, attenuate-acuminate, coarsely serrate; the primary 0.6–1.4 dm. long, with the midrib prominent beneath: bracts of the outer involucre 4–9, linear or lanceolate, acute, 1.5–3.5 cm. long: outer achenes 7.5–8.5 mm. long; the inner 8.7–10 mm. long, with marginal awns 3.5–5 mm. long.— Maine: tidal mud-flats of Cathance River, Bowdoinham, September 14 and 19, 1916, *Fernald & Long*, nos. 14825, 14927 (type in Gray Herb.), 14828, also in *Pl. Exsicc. Gray.* no. 295.

Var. **gaspensis**, n. var. *B. hyperborea* Fernald, Rhodora, x. 202 (1908) excluding plant of James Bay.— Estuaries of the rivers of the Gaspé Peninsula, Quebec. The following specimens may be cited: submerged at high tide, brackish shores about the mouth of Dartmouth River, August 26 & 27, 1904, *Collins, Fernald & Pease* (type in Gray Herb.); brackish shore, submerged at high tide, mouth of St. John River, Douglastown, August 23, 1904, *Fernald, Collins & Pease;* brackish shore, submerged at high tide, alluvial islands at the mouth of Bonaventure River, August 4, 1904, *Collins, Fernald & Pease;* material has also been seen from the mouth of York River, Gaspé and from the mouth of Matane River, Matane County (coll. *F. F. Forbes*).

Gray Herbarium.

A NEW PEREZIA ADVENTIVE IN MASSACHUSETTS.

J. Francis Macbride.

During last summer a strange daisy-like plant appeared in the vegetable garden of Mrs. Frank E. Lowe of North Worcester, Massachusetts. Because of its attractiveness it was allowed to grow and a specimen was sent to the Gray Herbarium for determination. Now study has disclosed the rather surprising fact that it is a species of *Perezia* seemingly undescribed and not closely related to any of the species in the section of the genus to which it belongs, a section which is represented only in South America. This group of species is at once distinguishable from the true Perezias of Mexico and Central America by the pauciseriate involucre and at one time was treated as a separate genus under the name *Homoeanthus*. The species are widely distributed, particularly over the sheep-grazing areas of the

southern continent, and in all probability the plant that occurred in Mrs. Lowe's garden, since the land was fertilized with wool-waste, grew from a seed that came in wool. The company from which the wool-waste was secured have informed Mrs. Lowe that a portion at least of the wool they use is South American. Remarkable as is this occurrence in New England of a new species native to South America the situation comes quite within the range of possibilities when one recalls that botanical exploration in the southern continent has been restricted to comparatively small areas and that there many species remain to be recognized. It may be mentioned that a number of species of *Perezia* have been proposed as new within recent years.

Since the genus *Perezia* belongs to the tribe *Mutisieae*, sometimes treated as the series *Labiataeflorae*, a group of the *Compositae* not known to many New England botanists, a few words in regard to the character of these plants may not seem out of place. This tribe (or series) stands next to the *Liguliflorae* from which it may be distinguished readily by the bilabiate corollas. The outer lip often is much longer than the inner; both not infrequently are toothed. Two genera are in cultivation, *Gerbera* and, to less extent, *Chaptalia*. In the latter genus the outer ray-flowers are always ligulate, a circumstance that suggests the close relationship of this group to the *Ligulaeflorae*. *Perezia*, however, is quite typical of the tribe having as it does all the corollas bilabiate. Our plant has a daisy-like aspect and until the corollas are examined might be referred to the tribe *Anthemideae* of the *Tubuliflorae*. Because of the open graceful habit of growth, the clear green color of foliage and the rather large heads (about 1.5 cm. in diameter) with white rays the plant is attractive enough to warrant growing for its beauty.

The notes upon the occurrence of this plant were kindly furnished by Mrs. Ella L. Horr of Worcester who sent to the Gray Herbarium the specimen for identification. Fortunately Mrs. Lowe transplanted the *Perezia* to a pot last fall where it has continued to blossom, and Mrs. Horr writes that there are now two plants which Mrs. Lowe will place in her wild flower garden this season in the hopes of securing fully mature achenes. In allusion to the plant as a wanderer it may be called

Perezia aletes, spec. nov., herba annua erecta ut videtur 3 dm. alta; caulibus glanduloso-puberulis vel hispidulis gracilibus deorsum simplicibus, sursum corymboso-paniculatis; foliis radicalibus rosulatis breviter petiolatis vel subsessilibus oblongis acutis subpinnatifidis circa 8 cm. longis, segmentis ovatis cuspidatis sed non spinulosis,

viridibus parce glanduloso-ciliatis; foliis caulinis inferioribus consimilibus sed brevioribus basi auriculatis, superioribus gradatim reductis fere integris solum ad apicem et ad basin paullo dentatis; capitulis multifloris pedunculatis, pedunculis plus minusve bracteolatis; involucris late campanulatis circa 1.5 cm. diametro; involucri squamis subbiseriatis herbaceis, interioribus obovatis margine spinuloso-denticulatis ad basin scariosis apice subacutis circa 9 mm. longis, exterioribus angustioribus circa 7 mm. longis rare denticulatis, omnibus parce subglanduloso-hispidulis; corollis albis florum radii circa 12 mm. longis, tubulo circa 4 mm. longo, labia exteriore oblonga circa 8 mm. longa 3 mm. lata apice obtusa minute tridentata, labia interiore circa 3.5 mm. longa acuminata integra; corollis florum disci abbreviatis; pappi setis circa 30 scabriusculis brunneis circa 6 mm. longis; achaeniis 4 mm. longis dense hirto-pilosis.

Annual erect herb about 3 dm. high with a basal rosette of subsessile oblong acute subpinnatifid leaves 8 cm. or more long, segments ovate, cuspidate, sparsely glandular-ciliate: lower stem-leaves similar but smaller, auriculate at base, upper gradually reduced and nearly entire, somewhat dentate only toward the base and apex: stems slender, glandular-puberulent or hispidulous, corymbosely paniculate above: heads pedunculate, many-flowered, peduncles more or less bracteolate: involucre broadly campanulate, about 1.5 cm. broad: bracts indistinctly 2-seriate, herbaceous, the inner obovate, subacute, margin spinulosely denticulate scarious toward the base about 9 mm. long, outer bracts narrower, about 7 mm. long, rarely denticulate, all slightly glandular-hispidulous: corollas white, radiate about 12 mm. long, tube about 4 mm. long, outer lip oblong, about 8 mm. long, 3 mm. broad, minutely tridentate at the obtuse apex: inner lip about 3.5 mm. long, acuminate, entire: disk-corollas smaller: pappus-setae brown, minutely scabrous, about 6 mm. long: achenes 4 mm. long, densely hirsute-pilose.— Massachusetts: adventive in vegetable garden fertilized with foreign wool-waste, North Worcester, 1917; communicated by *Mrs. Ella L. Horr*, April 9, 1918 (type, Gray Herb.).

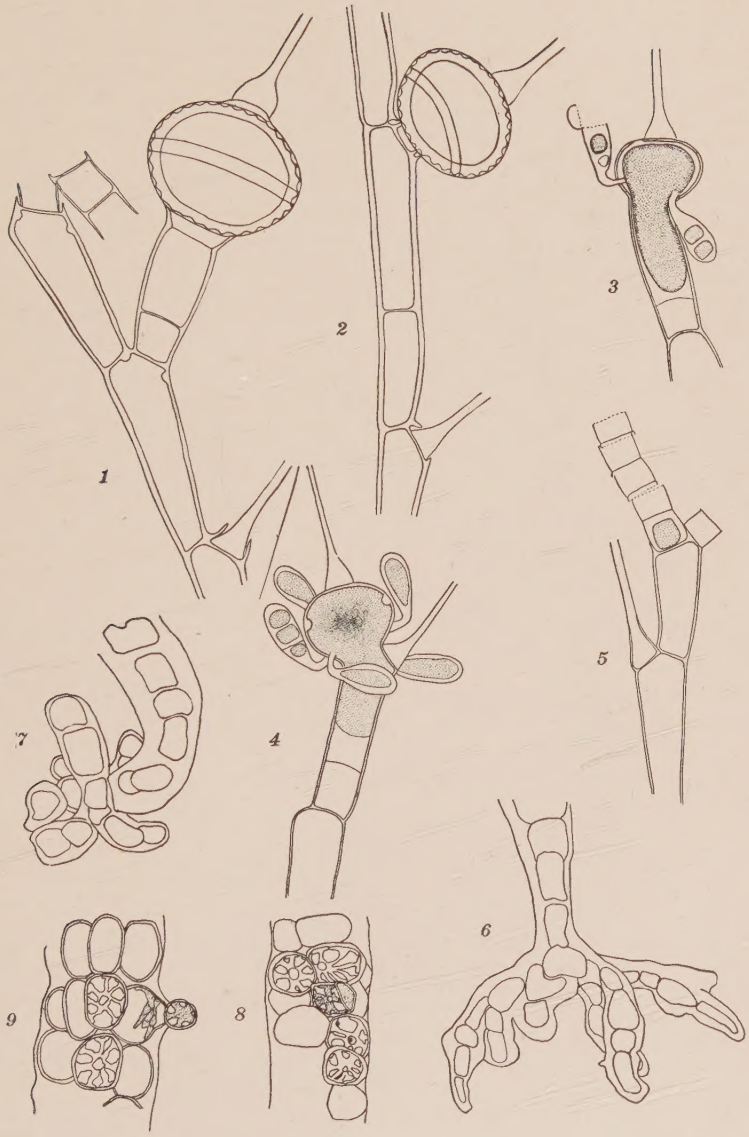
Gray Herbarium.

Carex paupercula Michx., var. **brevisquama,** n. var., squamis 3–4 mm. longis perigynium subaequantibus.

Scales 3–4 mm. long, about equalling the perigynium.— Quebec: Ile-aux-Coudres, Charlevoix Co., June, 1917, *Bro. M.-Victorin,* no. 4021 (type in Gray Herbarium).

Remarkable in its very short scales which give the plants a distinctive aspect, the long-acuminate scales of typical *C. paupercula* being 5–8 mm. in length and much exceeding the perigynia.— M. L. Fernald, Gray Herbarium.

Vol. 20, no. 235, including pages 117 to 132, was issued 22 July, 1918.



FIGS. 1–5. BULBOCHAETE FURBERAE.
" 6–9. ERYTHROTRICHIA RHIZOIDEA.

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